

REMARKS

In view of the above amendments and the following remarks, reconsideration of the outstanding office action is respectfully requested.

Pollution of the environment by pesticides creates problems and concerns. Residues of pesticides may originate when a crop is treated with a chemical or exposed unintentionally by drift, in irrigation water, in feed, or other routes. In 1993, the National Research Council of the USA published a report indicating that pesticides pose unique risks to children. Consequently, regulatory agencies are examining the effects of many pesticides, requiring registrants to conduct acute, subchronic, and development neurotoxicity studies for at least 140 pesticides. Pesticides heavily used in agriculture have been banned over the past several years by several governments. The USA recently banned sales of some uses of chlorpyrifos, a widely used insecticide, and has curtailed use of the fungicides chlorthalonil and iprodione. Methyl bromide, a widely used soil sterilizing agent (about 70,000 tons are used annually for this purpose) is a particularly vexing problem. In some locations, especially where winters are warm, this fumigant is necessary for efficient crop production. In its absence, diseases and pests can make crop production uneconomical. However, methyl bromide is damaging to the ozone layer as well as being toxic to humans in the vicinity of the application. The damage to the ozone layer is severe, and there is a worldwide ban that will be completed by 2005 in the developed countries and a few years later in the developing countries.

Modern intensive agriculture creates other problems as well. Nitrogen fertilizer that is not taken up by crops pollutes waterways. In the USA, concentrations of nitrates at or above Environmental Protection Agency ("EPA") maximum contaminant level (MCL) of 10 ppm for drinking water were detected in 15% of samples collected in shallow ground water beneath agricultural and urban lands, which is a concern for rural areas where shallow aquifers are used for drinking water supplies. Within the Mississippi River basin, nitrate may be found at concentrations approaching the MCL. In the USA, rivers and wells often exceed the maximum EPA allowable nitrate level for drinking water of 10 ppm, especially in the spring when leaching from new maize plantings is at its peak. Non-point source nitrate pollution from farms contributes to the zone of hypoxia along the coast of the USA in the Gulf of Mexico and other regions, and may also encourage growth of toxic estuarine microbes such as *Pfiesteria*. These environmental costs are high -- the EPA estimates that harmful algal blooms may have been responsible for an estimated

\$1,000,000,000 in economic losses during the past decade. Certainly not all of this loss can be attributed to agricultural activities; farmers, however, clearly will be required to bear increasingly large shares of these costs.

Various microorganisms long have been known to improve plant growth and productivity and reduce plant diseases. However, only now are these organisms being used to alleviate environmental ills and improve productivity.

Many biocontrol agents control pests through direct activity against the pest. However, single microbial and other compounds have been discovered that mimic many of the beneficial effects of biocontrol agents, and the same strains appear to improve plant growth and productivity of plants. Understanding the mechanisms of these compounds and the organisms that produce them may provide methods to substantially improve plant agriculture through improved methods of plant growth and development with reduced reliance on potentially harmful chemicals. The present invention is directed to overcoming these and other deficiencies in the art.

Applicant submits the above amendment to claim 1 is supported by the specification. In particular, the present application teaches that plants and plant seeds treated with *Trichoderma* spp. can be subjected to adverse conditions without the treated plant or plant grown from a treated seed incurring any adverse affect. In particular, the specification teaches a plurality of adverse environmental conditions, including adverse soil conditions (page 12, lines 6-15), drought conditions (Example 6), and biotic and abiotic stress (Example 9) that are well-tolerated by plants treated with *Trichoderma* spp.

The rejection of claims 1-2 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 4,828,600 to McCabe et al. ("McCabe") is respectfully traversed.

McCabe discloses facilitating the growth of corn plants using an inoculum of *Trichoderma hamatum* and *Trichoderma harzianum* spores applied to a plant seed, with or without a carrier. In contrast, the present invention as amended is drawn to "[a] method of promoting plant deep root development," which involves: "... applying *Trichoderma* spp. to a plant or plant seed under conditions effective to achieve deeper roots in the soil in a treated plant or plant grown from a treated seed than in untreated plants or plants grown from seed not treated with *Trichoderma* spp. and subjecting the treated plant or the plant grown from a treated seed to conditions which would not adversely affect the treated plant or the plant grown from a treated seed but would adversely affect untreated plants with shorter roots."

It is the position of the U.S. Patent and Trademark Office ("PTO") that McCabe inherently anticipates the claimed invention. Applicant disagrees.

The U.S. Court of Appeals for the Federal Circuit has established a standard for inherent anticipation as follows:

If the prior art reference does not expressly set forth a particular element of a claim, that reference still may anticipate if that element is “inherent” in its disclosure. To establish inherency, the extrinsic evidence “must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.”

In re Robertson, 169 F.3d 743, 745, 49 U.S.P.Q.2d 1949, 1950 (Fed. Cir. 1999) (quoting *Continental Can Co. USA, Inc., v. Monsanto Co.*, 948 F.2 1264, 1268, 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991)). Furthermore, it is well settled that a determination of whether a claimed element is inherently disclosed in a prior art reference requires certainty:

Inherency however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

In re Oelrich et al., 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (CCPA 1981) (quoting *Hansgirk v. Kemmer*, 102 F.2d 212, 214, 40 U.S.P.Q. 665, 667 (CCPA 1939)).

Firstly, McCabe nowhere discloses or suggests the element of “promoting plant deep root development . . .” No evidence is provided by McCabe that the promotion of deep plant rooting is a property “necessarily present” in the method, or that plant deep root development is a certain outcome of the method disclosed therein. McCabe measures percent changes in dry-shoot weight of corn and the yield of corn in *Trichoderma* spp. treated plant seeds compared to plants grown from seeds not treated with *Trichoderma* spp. No testing or measurement of root length is mentioned in McCabe. McCabe admits that the mechanism by which the fungal inoculants facilitate growth of corn plants is unknown (col. 3, lines 6-8). Indeed, McCabe acknowledges that while fungi are known to associate with the roots of plants, the nature of the association and the mechanisms involved are not characterized or understood (col. 1, lines 24-30 and lines 52-57).

Furthermore, McCabe clearly does not appreciate that “promoting deep rooting” in plants is a use for *T. harzianum* or other *Trichoderma* spp. Rather, McCabe teaches that an antagonistic action is involved when *Trichoderma* spp. are applied to plants and plant seeds, which probably results in improved germination (col. 3, lines 6-16).

McCabe also does not teach or suggest “. . .subjecting the treated plant or the plant grown from a treated seed to conditions which would not adversely affect the treated plant or the plant grown from a treated seed but would adversely affect untreated plants with shorter roots.” No where does McCabe teach or suggest that plants or plants seeds treated with *Trichoderma* spp. can be subjected to adverse conditions without adverse affect. There is no indication that plants and plant seeds treated with *Trichoderma* spp. should be subjected to adverse conditions, let alone that the treated plants and plants seeds would be protected from such adverse conditions.

Since McCabe does not recognize or achieve with certainty the elements of the claimed invention, the rejection of claims 1-2 under 35 U.S.C. § 102(b) as anticipated by McCabe is improper and should be withdrawn.

The rejection of claims 1-3 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,260,213 to Harman et al. (“Harman”) is respectfully traversed.

Harman discloses applying *T. harzianum* T-22 as a biocontrol agent to protect plants or plant seeds. It is the position of the PTO that Harman inherently anticipates the present invention. Applicant disagrees.

Applicant submits that Harman does not meet the above-described standards for inherent anticipation. In particular, Harman specifically teaches employing *Trichoderma* spp. in an amount and a manner to prevent or retard, i.e., control, the attack of a soil borne pathogen on the seed being protected (col. 5, lines 56-58). Harman provides no evidence of testing or data that would suggest that the using the method taught therein will “promote plant deep root development,” or that deep root development is “necessarily present” or exists as a certain outcome as a result of applying *Trichoderma* spp. to plants for biocontrol as described therein. Furthermore, Harman does not teach or suggest “. . .subjecting the treated plant or the plant grown from a treated seed to conditions which would not adversely affect the treated plant or the plant grown from a treated seed but would adversely affect untreated plants with shorter roots.” Additionally, no evidence is provided in Harman that one should, or could, subject plants and plant seeds treated with *Trichoderma* to adverse conditions, let alone that the protection of treated plants and plants seeds against adverse conditions is “necessarily present” in the method.

Since Harman does not meet the standards required for inherent anticipation set by the Federal Circuit, the rejection of claims 1-3 for anticipation by Harman is improper and should be withdrawn.

In view of all of the foregoing, applicant submits that this case is in condition for allowance and such allowance is earnestly solicited.

Respectfully submitted,

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